Claims:

1. A multi-rate switching system comprising:

an ATM (asynchronous transfer mode) switch having a plurality of input and output ports each having different port numbers assigned thereto, wherein ATM cells arriving at respective ones of the input ports are transferred to appropriate ones of the output ports in units of a predetermined time period based on header information of each of the ATM cells;

a cell demultiplexer for distributing a flow of incoming ATM cells in units of an ATM cell to a plurality of predetermined input ports of the ATM switch in an order in which the incoming ATM cells arrived; and

a cell multiplexer for multiplexing outgoing ATM cells received in parallel from a plurality of predetermined output ports of the ATM switch to produce a flow of outgoing ATM cells.

2. The multi-rate switching system according to claim 1, wherein the cell demultiplexer comprises:

a first selector for sequentially selecting parallel lines in a predetermined order of the parallel lines to output an incoming ATM cell to a selected one of the parallel lines, wherein the parallel lines correspond to the predetermined input ports of the ATM switch; and

a first FIFO buffer for temporarily storing incoming ATM cells received through the parallel lines from the first selector in a first-in-first-out (FIFO) scheme to output them in parallel to the predetermined input ports of the ATM switch in synchronization with each other.

3. The multi-rate switching system according to claim 2, wherein the cell multiplexer comprises:

a second selector for sequentially selecting one of the outgoing ATM cells in a predetermined order of the predetermined output ports to produce the flow of the outgoing ATM cells.

4. The multi-rate switching system according to claim 1, wherein the ATM switch comprises:

a second FIFO buffer for temporarily storing ATM cells to be transferred to respective ones of the input ports in a FIFO scheme;

a switch controller for controlling cell switching of a plurality of ATM cells to be forwarded to the predetermined output ports such that the plurality of ATM cells to be forwarded to the predetermined output ports are sequentially assigned to sequential ones of the predetermined output ports in a circular manner; and

an ATM switch core for switching the ATM cells stored in the second FIFO buffer under cell switching control

of the switch controller.

5. The multi-rate switching system according to claim 3, wherein the ATM switch comprises:

a second FIFO buffer for temporarily storing ATM cells to be transferred to respective ones of the input ports in a FIFO scheme;

a switch controller for controlling cell switching of a plurality of ATM cells to be forwarded to the predetermined output ports such that the plurality of ATM cells to be forwarded to the predetermined output ports are sequentially assigned to sequential ones of the predetermined output ports in a circular manner; and

an ATM switch core for switching the ATM cells stored in the second FIFO buffer under cell switching control of the switch controller.

6. The multi-rate switching system according to claim 3, wherein the cell demultiplexer further comprises:

a first sequence controller for providing each of the incoming ATM cells with a sequence identification number indicating an arrival order thereof, wherein the incoming ATM cells with sequence identification numbers are transferred to the first selector.

7. The multi-rate switching system according to claim

6. wherein the cell multiplexer further comprises:

a third FIFO buffer for temporarily storing the outgoing ATM cells in a FIFO scheme; and

a second sequence controller for determining whether the outgoing ATM cells stored in the third FIFO buffer are in order by checking the sequence identification numbers of the outgoing ATM cells, wherein, if the outgoing ATM cells are not in order, then the second sequence controller controls the third FIFO buffer such that the outgoing ATM cells are read out from the third FIFO buffer in the order of the sequence identification numbers.

8. The multi-rate switching system according to claim 7, wherein the ATM switch comprises:

a second FIFO buffer for temporarily storing ATM cells to be transferred to respective ones of the input ports in a FIFO scheme;

a switch controller for controlling cell switching of a plurality of ATM cells to be forwarded to the predetermined output ports such that the plurality of ATM cells to be forwarded to the predetermined output ports are sequentially assigned to sequential ones of the predetermined output ports in a circular manner; and

an ATM switch core for switching the ATM cells stored in the second FIFO buffer under cell switching control of the switch controller.

9. A multi-rate switching method using an ATM (asynchronous transfer mode) switch having a plurality of input and output ports each having different port numbers assigned thereto, wherein ATM cells arriving at respective ones of the input ports are transferred to appropriate ones of the output ports in units of a predetermined time period based on header information of each of the ATM cells, the method comprising the steps of:

a) distributing a flow of incoming ATM cells in units of an ATM cell to a plurality of predetermined input ports of the ATM switch in an order in which the incoming ATM cells arrived; and

b) multiplexing outgoing ATM cells received in parallel from a plurality of predetermined output ports of the ATM switch to produce a flow of outgoing ATM cells.

10. The multi-rate switching method according to claim 9, wherein the step (a) comprises the steps of:

a.1) sequentially selecting parallel lines in a predetermined order of the parallel lines to output an incoming ATM cell to a selected one of the parallel lines, wherein the parallel lines correspond to the predetermined input ports of the ATM switch; and

a.2) temporarily storing incoming ATM cells received through the parallel lines in a first FIFO (first-

in-first-out) buffer to output them in parallel to the predetermined input ports of the ATM switch in synchronization with each other.

11. The multi-rate switching method according to claim 10, wherein the step (b) comprises the step of:

b.1) sequentially selecting one of the outgoing ATM cells in a predetermined order of the predetermined output ports to produce the flow of the outgoing ATM cells.

12. The multi-rate switching method according to claim 9, further comprising the steps of:

at the ATM switch,

temporarily storing ATM cells to be transferred to respective ones of the input ports in a second FIFO buffer;

controlling cell switching of a plurality of ATM cells to be forwarded to the predetermined output ports such that the plurality of ATM cells to be forwarded to the predetermined output ports are sequentially assigned to sequential ones of the predetermined output ports in a circular manner; and

switching the ATM cells stored in the second FIFO buffer under control of the cell switching.

13. The multi-rate switching method according to claim 11, further comprising the steps of:

at the ATM switch,

temporarily storing ATM cells to be transferred to respective ones of the input ports in a second FIFO buffer;

controlling cell switching of a plurality of ATM cells to be forwarded to the predetermined output ports such that the plurality of ATM cells to be forwarded to the predetermined output ports are sequentially assigned to sequential ones of the predetermined output ports in a circular manner; and

switching the ATM cells stored in the second FIFO buffer under control of the cell switching.

14. The multi-rate switching method according to claim 10, wherein the step (a) further comprises the step of:

a.0) providing each of the incoming ATM cells with a sequence identification number indicating an arrival order thereof, wherein the incoming ATM cells with sequence identification numbers are used at the step (a.1).

15. The multi-rate switching method according to claim 11, wherein the step (b) further comprises the steps of:

temporarily storing the outgoing ATM cells in a third FIFO buffer;

determining whether the outgoing ATM cells stored in the third FIFO buffer are in order by checking the sequence identification numbers of the outgoing ATM cells;

when the outgoing ATM cells are not in order, controlling the third FIFO buffer such that the outgoing ATM cells are read out from the third FIFO buffer in the order of the sequence identification numbers.

16. The multi-rate switching method according to claim 15, further comprising the steps of:

at the ATM switch,

temporarily storing ATM cells to be transferred to respective ones of the input ports in a second FIFO buffer;

controlling cell switching of a plurality of ATM cells to be forwarded to the predetermined output ports such that the plurality of ATM cells to be forwarded to the predetermined output ports are sequentially assigned to sequential ones of the predetermined output ports in a circular manner; and

switching the ATM cells stored in the second FIFO buffer under control of the cell switching.